Industry Led Market Transformation

FY2011 Performance/Finance Framework

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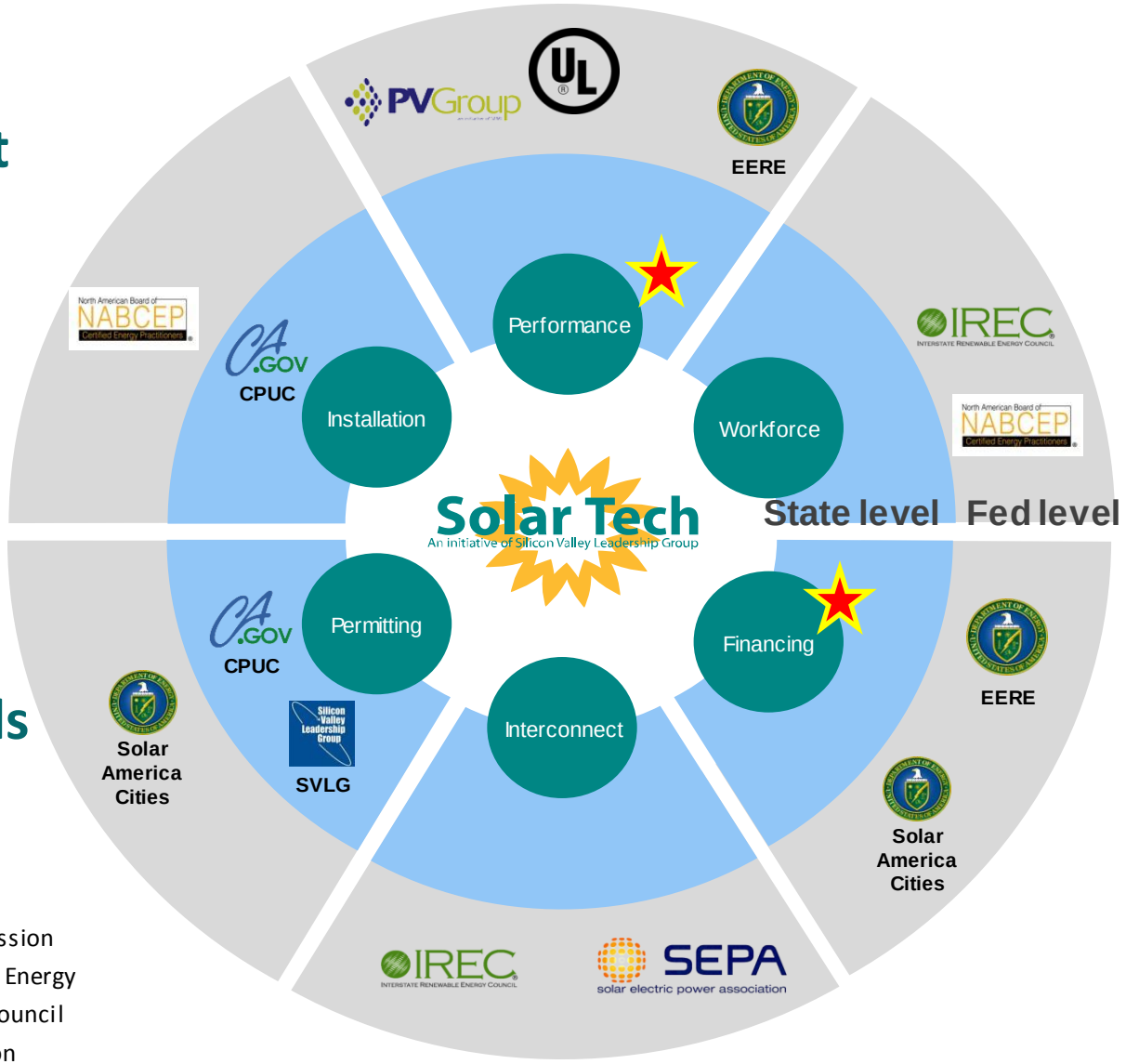
Making Solar Happen. Since 2006.

About SolarTech

Scalable, Local best practices, National impact

Collaborative Consortium

Integrated Systematic methods



CPUC : California Public Utility Commission
EERE : Energy Efficiency & Renewable Energy
IREC : Interstate Renewable Energy Council
SEPA : Solar Electric Power Association
SVLG : Silicon Valley Leadership Group
UL: Underwriters Laboratories
NABCEP: N.A. Board of Certified Energy Practitioners

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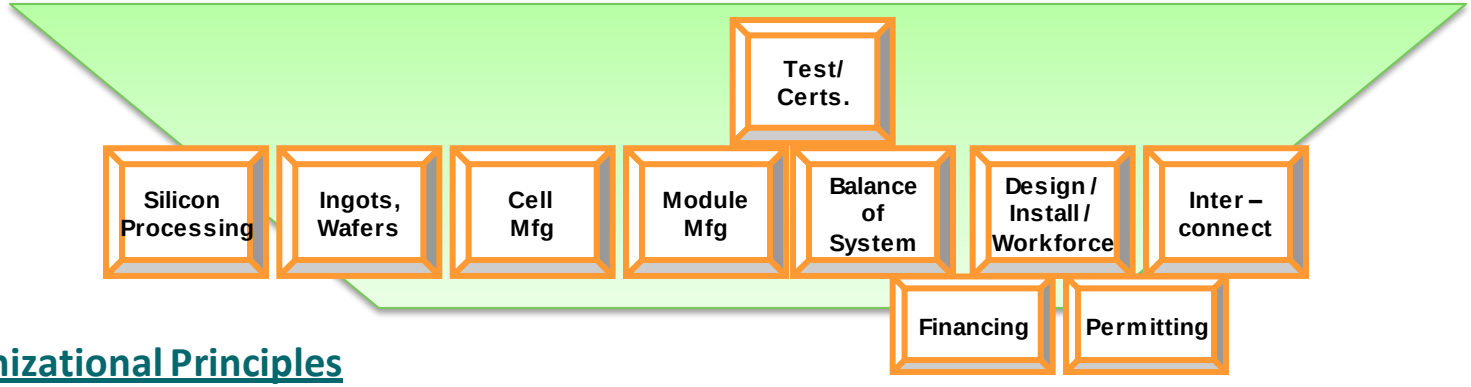
Systems Driven, Total Value Chain Approach to Private / Public Collaboration



Organizational Principles

- Broad Collaboration across entire Value Chain
- Cycle time is a Competitive Advantage
- Commercialization of new technologies is Critical
- Mass Adoption through Scalable Solutions
- Simplify and Deliver Compelling Value Propositions to Consumers

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Executive Summary

Problems

- US solar energy <1% of energy mix (but could be 15% by 2020)
- Consumer perception of Solar Energy
  - "Costly, Confusing, Complicated"
- Soft + BoS costs are now > Primary costs (Modules, Inv.)
- Retail DG opportunities are getting lost in the LCOE game

Solution (Goals)

- Consumers: 25% faster decisions thru clear Value Prop
- Execution: 50% less paperwork, 40% faster projects
- Business Systems: 20% increase in overall industry capacity to deliver PV across the entire value chain

$$\frac{\$}{?} \rightarrow \frac{\$}{kWh}$$

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Shifting end market from $/? to $/kWh….

- WHO - Stakeholders and what are their respective roles?
  - National Labs, Test & Certification Orgs, Dept of Energy?
  - Consumers - Education, Awareness, Outreach
  - Who leads, who follows, who supports?
- WHAT - Can industry standardize language, metrics, and tools?
  - STC & PTC ratings, tilt & orientation are not enough – What else?
  - What additional factors must be “standardized”?
  - What can’t or shouldn’t?
- WHEN - Ready for unified, 3rd party performance standards ?
  - The notion of EPA MPG ratings for vehicles
  - How do we achieve harmonization of codes? US, IEC, etc.
- WHY - Total Cost of Ownership is emerging as a key driver.
  - What is it?
  - How does reliability factor in and do we now enough yet?
  - How will monitoring & diagnostics improve “TCO”?

Finance

Cost / Time: Simplified Transactions, Predictability, Faster closure, More Options

- **Goal:** "Bankable" projects, Better Due Diligence Approach for Developers, **25% reduction in transaction costs**
- **Common Problems**
  - Widespread adoption of financing is still relatively new, Complex "Product"
  - **Lack of standardization and transparency in financial and contractual terms**
  - Waste time negotiating ALL language vs. focus on ~20% variation deal to deal
- **Solutions / Initiatives**
  - Standard PPA Commercial Project Contract, PPA Site License Agreement
  - Standard due diligence checklist, Standard Request for Information
  - Consumer Guide of Financing Options
- **Future State**
  - Solidify confidence in solar financing – Establish "FDIC-like" structure
  - Standard processes reduce risk. Capital flows to quality, predictability

Performance

Consistency: Modeling, Ratings, kWh Projections Certifications, Links to Financing

- **Goal:** Achieve 25% faster buying decisions through standard performance metrics, energy production tools
- **Common Problem**
  - Lack of standard language, metrics, and tools for PV system performance
  - Inconsistent economics, impacts the value proposition to consumers
  - **Broad reliability data, FMEA, MTBF, MTTR, etc is in its infancy**
  - **Industry system uptime and availability <90% (market expectation)**
- **Solutions / Initiatives**
  - **Standards at all levels: terminology, monitoring, design, degradation, LCOE, bankable performance ratios, guaranteed outputs, 3rd party certification**
  - Good Faith Estimate tool, Coordination with SunSpec Alliance (data, I/O)
- **Future State**
  - Demystify Energy (kWh) vs. Power (W), Consumer Education
  - Unified 3rd party performance standards – "90 % of systems/90 % uptime"
  - **Tighter linkages between Energy Ratings, Rower Ratings, Project Finance**

7/12 Performance Symposium "Findings"

- Manage Expectations (Quantitatively) Sandia/DOE
- Data I/O transparency SunSpec Alliance
- Conflicts & Challenges in getting from here to there
  - DC:DC optimizer data shows 22% of strings ~ 10% below target
  - System uptime and availability <90%
  - 73% projects seeking cost based monitoring exemptions (EPBB)
  - 13% of systems have metered data vs. 46% of installed capacity
  - Flight to Quality is being abandoned due to downward $ pressure
  - Reliability data, FMEA, MTBF, MTTR, etc is in its infancy
  - +/- 5% kWh variation translates to 5-7% range in financing (Res)
- Conclusion – It gets harder from here…
  - Standardization is no longer optional
  - It's now about What by When?

Summary

Performance

Goal:
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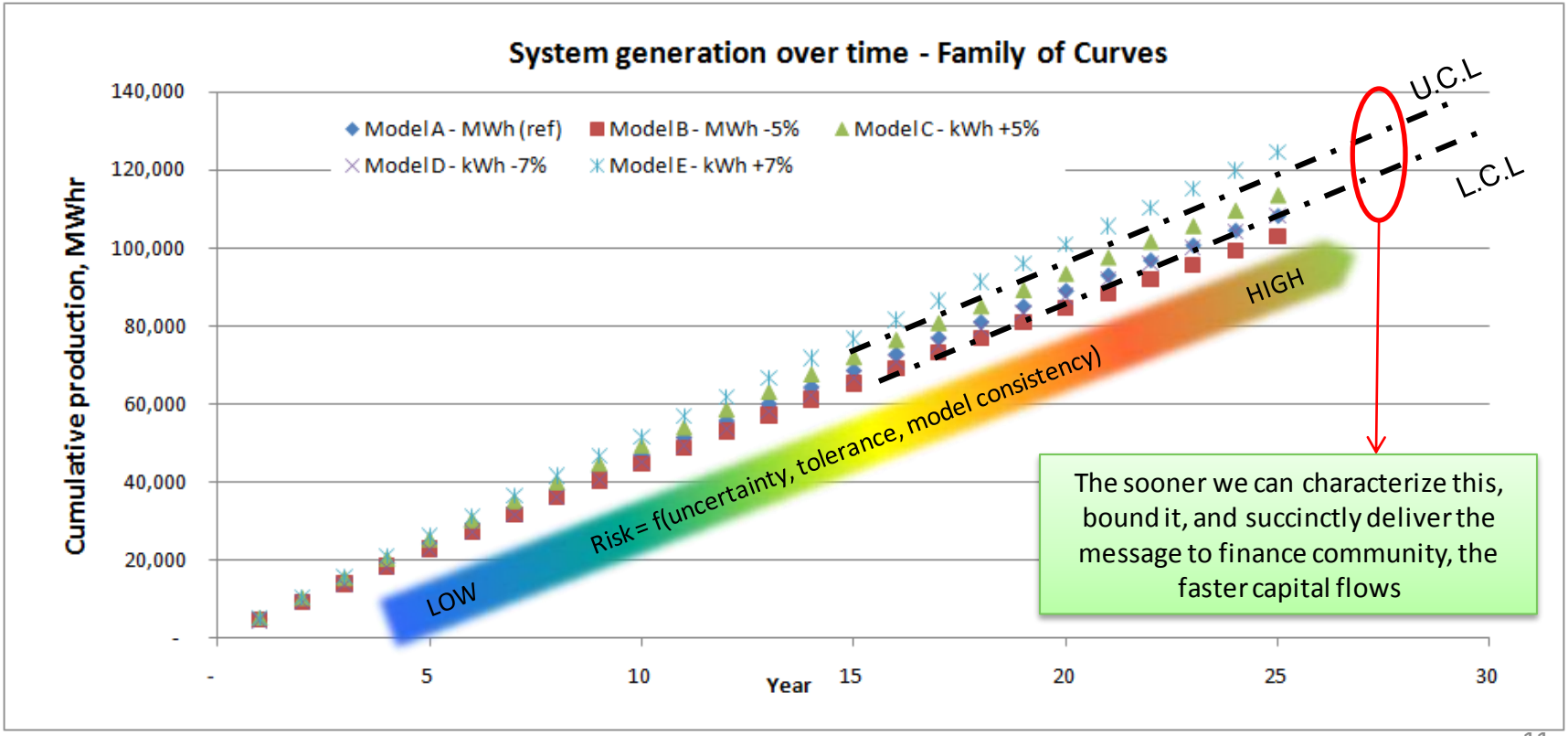
Conceptual Tool for the $$$ guys

- A "Model of Models" (built off of a 3.65MWp, multi-site school district project)
  - Family of cumulative kWh projection curves, one curve / model
  - Uncertainty can be factored in various ways
  - Tolerance bands a.k.a. "risk" can be applied qualitatively
  - System monitoring provides closed loop process control , model validation/correction
  - Regular updates (quarterly) drives out uncertainty, liquidity increases



A path to standardization of Performance / Finance runs through National Labs, Consortia, and Industry

- National Labs
  - Modeling engine(s)
  - Tools, techniques, parameters
  - Validation
  - The ultimate determinant behind kWh
- Consortia
  - Interface across industry, financial community, DOE, Labs
  - Drive development, dissemination, and adoption of best practices
  - Market messaging to move the ball forward between kWh projections and increasing liquidity by showing bankability
- Industry
  - Ongoing feedback on tools, techniques
  - Provide system field data to increase model validation, of any model
  - Commitment. Standardization is a 2 way street.